SolaGen Incorporated

33993 Lawrence Road
Deer Island, Oregon 97054

Phone 1-503-366-4210
Fax 1-503-366-4215
E-mail fsharron@solageninc.com
Web site www.solageninc.com

May 28, 2008

Ms. Angela Farr
Biomass Utilization Coordinator
Montana DNRC

Dear Angela,

SolaGen Incorporated is in receipt of the emission test report for the boiler conversions in Townsend Montana. The report references emission performance of one of the two SolaGen Wood Pellet Fired Boilers. The original engineering and equipment scope for this project was to integrate an economical biomass fueled system to offset the consumption of heating oil.

1. SolaGen was to reuse two Burnham vertical fire tube hot water boilers. These boilers were in good mechanical condition but their inherent design yields low process efficiency.
2. The existing boiler room offered significant design complexities which in turn limited the ability to offer the best equipment scope (performance basis) for the anticipated fuel type.
3. The project budget was limited which in turn limited the ability to offer the best equipment scope (performance basis) for the anticipated fuel type.

A general review the report Executive Summary offers insight regarding the performance of the pellet fired system. Overall, most source pollutants in this application are quite reasonable given the cost of the hardware.

1. Particulate matter: The boiler is an uncontrolled source in that there is no particulate collection hardware installed. The actual emission factor for this system is well below the allowable limit as set by Montana DEQ. Compared to other biomass fired systems (i.e.: wood chip or hog fuel) that are uncontrolled this pellet system compares favorably. The predominant reason is due to the relatively low quantity of “fines” in the fuel and low gas velocity through the combustion chamber.
2. NOx: The measurement of this constituent is not really relevant. In biomass fuels NOx generation is generally a function of the quantity of nitrogen that is fixed in the fuel, commonly referred as FBN and it’s associated “Chemical NOx Pathway”. With some biomass fuels, nitrogen content can be relatively high leading to high NOX emission levels. In most grate or pile biomass applications little NOx is derived from “Thermal NOx Pathway” as peak flame temperatures are low and the relative combustion process is slow. Therefore, the NOx emission level can only be quantified once the nitrogen content in the specific fuel sample can be determined.
3. CO: The formation of CO generally occurs with a rich air/fuel ratio, poor mixing, or flame quenching. The tabulated CO levels are not uncommon but this application

could be tuned to a lower emission value. Due to the low moisture content of the pellet fuel, a relatively high combustion air rate has been metered into the combustion chamber to reduce the flame temperature. In this application/equipment type, high flame temperatures may yield ash fusion or clinkering which is not desired from a maintenance standpoint. There is a balance that has to be drawn between CO production and maintenance in this case. A reduction in flame quenching will yield lower CO, possibly in the range of 200-300 ppmdv. If a different SolaGen equipment offering could have been utilized, such as our HDF-WC stoker, we could have realized CO less than 100 ppmdv at high fire.

In conclusion, the performance of these boilers is quite acceptable from an emissions standpoint. Further improvements could be made with additional tuning and the installation of collection hardware.

Very truly yours,

Francis Sharron

Francis Sharron
President
SolaGen Incorporated